Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: .....]

Uni. Roll No. …….

Program: B.Tech. (Scheme 2018)
Semester: 1,2
Name of Subject: Chemistry
Subject Code: BSC-105
Paper ID: 15933

07-07-21(M)

Time Allowed: 02 Hours **Max. Marks: 60**

NOTE:

1) Each question is of 10 marks.
2) Attempt any six questions out of nine
3) Any missing data may be assumed appropriately

Q1. Describe in details Zeolite and Ion-exchange methods for softening of hard water? Which method is better and why? (10)

Q2. (a) What type of information is obtained by studying UV-Visible, IR and ^{1}H-NMR of an organic compound? Discuss giving examples. (5)

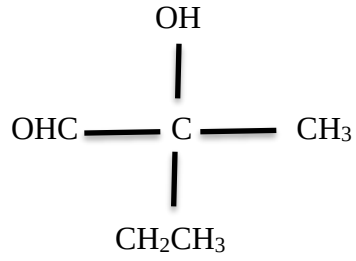
(b) A monochromatic radiation is incident on a solution of 0.05 molar concentration of an absorbing substance. The intensity of the radiation is reduced to one-fourth of the initial value after passing through 10 cm length of the solution. Calculate the molar extinction coefficient of the substance. (5)

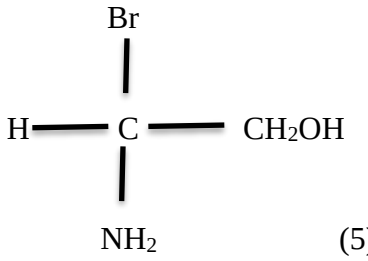
Q3. (a) What is crystal field theory? How does this theory explain the bonding and magnetic behaviour of $[Fe(H_2O)_6]^{2+}$and $[Fe(CN)_6]^{3-}$ complexes? (5)

(b) What is a semiconductor? Write the difference in the semiconductors obtained by doping silicon with As or with Ga? (5)

Q4. (a) How will propene react with hydrogen bromide in the presence of peroxide and in the absence of any peroxide? Write down the mechanism of these reactions. (5)

(b) Assign R and S configurations to the following compounds by giving suitable reasons:

(i) 

(ii) 

(5)

Q5. (a) Calculate the cell e.m.f. and the value of free energy change for the cell reaction at 25°C for the cell:

$$Zn(s) \mid Zn^{2+}(0.0004\ M) \mid\mid Cd^{2+}(0.2\ M) \mid Cd(s)$$

E° values at 25°C: $Zn^{2+} \mid Zn$ = - 0.763 V; $Cd^{2+} \mid Cd$ = - 0.403 V (5)

(b) 'Cyclohexane exists mainly in the chair form' Justify it with relevant reasons? (5)

Q6. (a) What is excluded volume? Show that the excluded volume is four times the actual volume of a gas. (5)

(b) 'Gases have high compressibility but solids and liquids have poor compressibility' Comment on it. (5)

Q7. How does phase diagram of Pb-Ag system is differ from that of KI-H_2O system and why? Also briefly explain the process, which is used for enrichment of silver. (10)

Q8. (a) Calculate the amount of lime (91% pure) and soda (97.2% pure) required for treatment of one million litres of water, whose impurities are: Ca^{2+}= 30 ppm, Mg^{2+}= 42 ppm, HCO_3^- = 183 ppm, $FeSO_4.7H_2O$ = 69.5 ppm, KCl = 27.8 ppm and $NaCl$ = 100 ppm. (5)

(b) "IR spectra is often characterized as molecular finger prints." Why? (5)

Q9. (a) Explain and draw high resolution NMR spectra of: $CH_3CH_2COCH_3$ (5)

(b) The K_{sp} value of two sparingly soluble salts $Ni(OH)_2$ and $AgCN$ are 2.0×10^{-15} and 6.0×10^{-17}respectively. Which salt is more soluble? (5)

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